The invention claimed is:

1. A bulge forming mechanism for forming bulges in a wire having helically coiled strands by untwisting the strands in an anti-helical direction at a predetermined position to form an electrical connector from a segment of a length of the wire, comprising:

a first gripping assembly including a first clamp member and a first actuator, the first clamp member moving to a closed position to grip the wire and prevent the wire from moving relative to the first clamp member and to an open position in which the wire is free to move relative to the first clamp member, the first actuator connected to the first clamp member to selectively move the first clamp member into the open and closed positions; and

a second gripping assembly including a second clamp member and a second actuator, the second clamp member moving to a closed position to grip the wire and prevent the wire from moving relative to the second clamp member and to an open position in which the wire is free to move relative to the second clamp member, the second actuator connected to the second clamp member to selectively move the first clamp member into the open and closed positions; and

a rotating carrier interconnecting the first and second gripping assemblies to rotate the first and second clamp members relative to one another in at least one complete relative revolution in a single relative rotational direction which is anti-helical relative to the strands of the wire, the rotating carrier also positioning the first and second clamp members at a spaced apart location above and below the predetermined location where a bulge is to be formed.

2. A bulge forming mechanism as defined in claim 1 wherein:

the first and second actuators close the first and second clamp members during a relative rotational interval of greater than one-half of a complete relative revolution of the clamp members.

3. A bulge forming mechanism as defined in claim 1 wherein:

the first and second actuators close the first and second clamp members during a relative rotational interval of approximately three-fourths of a complete relative revolution of the clamp members.

4. A bulge forming mechanism as defined in claim 1 wherein:

the first and second actuators open the first and second clamp members during a relative rotational interval of less than one-half of a complete relative revolution of the clamp members, the relative rotational interval when the first and second clamp members are in the open position permits the wire to be advanced.

5. A bulge forming mechanism as defined in claim 4 further comprising:

a drive motor connected for a rotating the rotating carrier; and

the drive motor slows the relative rotation of the first and second gripping assemblies relative to one another during the relative rotational interval when the first and second clamp members are in the open position.

6. A bulge forming mechanism as defined in claim 4 further comprising:

a drive motor connected for rotating the rotating carrier to achieve a relative rotational rate of the first and second gripping assemblies; and

the drive motor controls the relative rotational rate of the first and second gripping assemblies relative to one another during the relative rotational interval when the first and second clamp members are in the open position to establish selective time intervals during which the clamp members occupy the open position.

7. A bulge forming mechanism as defined in claim 6 wherein:

the drive motor establishes the time period of the relative rotational interval when the first and second clamp members are in the open position independently of the time period of the relative rotational interval when the first and second clamp members are in the closed position by controlling the relative rotational rate.

8. A bulge forming mechanism as defined in claim 7 further in combination with a wire feeding mechanism which advances wire to the bulge forming mechanism during the relative rotational interval when the first and second clamp members are in the open position.

9. A bulge forming mechanism as defined in claim 4 further in combination with a wire feeding mechanism which advances wire to the bulge

forming mechanism during the relative rotational interval when the first and second clamp members are in the open position.

10. A bulge forming mechanism as defined in claim 9 wherein the wire feeding mechanism advances the wire to the predetermined position where a bulge is to be formed in the wire by the bulge forming mechanism during the relative rotational interval when the first and second clamp members are in the open position.

11. A bulge forming mechanism as defined in claim 10 further in combination with a wire severing apparatus which severs the segment of the wire upon which the bulges have been formed from a remaining length of the wire, the wire feeding mechanism advancing the wire during the relative rotational interval when the first and second clamp members are in the open position, the wire feeding mechanism advancing the wire to a predetermined position where it is to be severed after all of the bulges have been formed in the segment of the wire.

12. A bulge forming mechanism as defined in claim 11 further comprising:

a drive motor electrically connected for a rotating the rotating carrier; and

the drive motor slows the relative rotation of the first and second gripping assemblies relative to one another during the relative rotational interval when the first and second clamp members are in the open position.

13. A bulge forming mechanism as defined in claim 12 wherein:

the drive motor temporarily stops the relative rotation of the first and second gripping assemblies relative to one another during the relative rotational interval when the first and second clamp members are in the open position.

14. A bulge forming mechanism as defined in claim 1 wherein:

one of the first or second actuators is mechanically operated; and

the other one of the first or second actuators is electrically operated.

15. A bulge forming mechanism as defined in claim 14 further comprising:

a sensor located to sense the operation of the mechanically-operated actuator and to supply a signal upon the operation of the mechanically-operated actuator; and wherein:

the electrically-operated actuator is operated in response to the signal from the sensor.

16. A bulge forming mechanism as defined in claim 1 wherein:

at least one of the first or second actuators is mechanically operated.

17. A bulge forming mechanism as defined in claim 1 wherein:

At least one of the first or second actuators is electrically operated.

18. A bulge forming mechanism as defined in claim 1 wherein:

the first and second actuators open the first and second clamp members approximately at the same time during a relative revolution of the clamp members.

19. A bulge forming mechanism as defined in claim 1 wherein:

the first and second actuators close the first and second clamp members approximately at the same time during a relative revolution of the clamp members.

20. A bulge forming mechanism as defined in claim 1 wherein:

the first gripping assembly is retained in a stationary position; and

the second gripping assembly is connected to the rotating carrier to rotate in conjunction with the rotating carrier and relative to the first gripping assembly.

21. A bulge forming mechanism as defined in claim 20 further comprising:

a drive motor connected for rotating the rotating carrier in complete revolutions in a single rotational direction; and wherein:

the second actuator is mechanically operated by rotation of the rotating carrier to move the second clamp member into one of either the open or the closed positions at a predetermined point in each revolution of the rotating carrier.

22. A bulge forming mechanism as defined in claim 21 further comprising:

a trip pin located adjacent to the rotating carrier; and wherein:

the second actuator includes an actuating arm extending from the rotating carrier to contact the trip pin during rotation of the rotating carrier to move the second clamp member into one of either the open or the closed positions.

23. A bulge forming mechanism as defined in claim 22 further comprising:

a second trip pin in addition to the trip pin first aforesaid; the second trip pin also located adjacent to the rotating carrier; and wherein:

the second actuator includes a second actuating arm in addition to the actuating arm first aforesaid;

the first actuator arm contacting the first trip pin to move the second clamp member into the open position; and

the second actuating arm also extending from the rotating carrier to contact the second trip pin during rotation of the rotating carrier, the second actuating arm contacting the second trip pin to move the second clamp member into the closed position.

24. A bulge forming mechanism as defined in claim 23 wherein:

at least one of the first or second trip pins is located at a stationary position relative to the rotating carrier.

25. A bulge forming mechanism as defined in claim 23 wherein:

the rotating carrier comprises a carrier disk having a peripheral edge;

the second actuator comprises a cam wheel positioned for rotation relative to the carrier disk had a location adjacent to the peripheral edge of the carrier disk; and

the cam wheel including the first and second actuator arms extending beyond the peripheral edge of the carrier disk to contact the first and second trip pins, respectively, upon rotation of the cam wheel relative to the carrier disk.

26. A bulge forming mechanism as defined in claim 25 wherein:

the second clamp member comprises at least one lever arm which moves the second clamp member between the open and closed positions when pivoted; and

the cam wheel further includes a surface which contacts the lever arm and pivots the lever arm upon rotation of the cam wheel.

27. A bulge forming mechanism as defined in claim 25 wherein:

the second clamp member comprises a pair of separated lever arms which move the second clamp member between the open and closed positions when pivoted;

the cam wheel is positioned between the separated lever arms and further includes a cam surface which contacts the lever arms and pivots the lever arms upon rotation of the cam wheel as a result of one of the actuator arms contacting one of the trip pins.

28. A bulge forming mechanism as defined in claim 27 wherein:

the second clamp member further comprises one jaw member connected to one of the lever arms and one jaw member connected to the other lever arm, the jaw members contacting and holding the wire when the second clamp member is in the closed position;

rotation of the cam wheel and the cam surface pivots the lever arms to move the connected jaw members apart and toward one another to achieve the open and closed positions of the second clamp member, respectively;

29. A bulge forming mechanism as defined in claim 28 wherein:

each of the jaw members includes a contact surface which is crescent shaped.

30. A bulge forming mechanism as defined in claim 28 wherein:

each of the jaw members includes a contact surface shaped to reposition the strands of the wire when contacted and held into a cross-sectional configuration having a radial component upon movement of the second clamp member to the closed position.

31. A bulge forming mechanism as defined in claim 28 wherein:

each lever arm and the jaw member is formed from a sheet of material having a thickness;

each jaw member includes a contact surface by which to contact and hold the wire; and

the contact surface of each of the jaw members is reduced in thickness relative to the thickness of the sheet of material to reduce a surface area of the contact surface which contacts and holds the wire.

32. A bulge forming mechanism as defined in claim 28 wherein:

the second clamp member is formed from a sheet of spring tempered material;

the spring tempered material creates resilient characteristics in the second clamp member; and

the resilient characteristics normally force the lever arms toward one another to bias the second clamp member to the closed position.

33. A bulge forming mechanism as defined in claim 28 wherein:

the second clamp member further comprises an end portion to which the lever arms are connected and from which the lever arms extend;

the lever arms and end portion are integrally formed from a sheet of spring tempered material;

the spring tempered material creates resilient characteristics in the second clamp member; and

the end portion is connected to the carrier disk at a position diametrically opposite from the location where the actuator wheel is rotationally positioned on the carrier disk.

34. A bulge forming mechanism as defined in claim 33 wherein:

the second clamp member further includes an arcuate portion which connects each lever arm to the end portion;

the resilient characteristics of the lever arms, the arcuate portions and the end portion normally force the lever arms toward one another to bias the jaw members apart the second clamp member to the closed position; and

the rotation of the cam wheel causes the cam surface of the cam wheel to force the lever arms apart from one another against the force of the resilient characteristics of the second clamp member.

35. A bulge forming mechanism as defined in claim 28 wherein:

the rotating carrier rotates about an axis of rotation;

the contact surfaces of the jaw members of the second clamp member are positioned concentrically about an axis of rotation of the rotating carrier; and

the rotating carrier includes a hole located at the axis of rotation through which the wire extends.

36. A bulge forming mechanism as defined in claim 22 further comprising:

a sensor located adjacent to the trip pin to sense the contact of the actuating arm with the trip pin and to supply a signal upon such contact; and wherein:

the first actuator is operated in response to the signal from the sensor.

37. A bulge forming mechanism as defined in claim 21 wherein:

the drive motor is a stepper motor.

38. A bulge forming mechanism as defined in claim 20 wherein:

the first clamp member comprises an arm which pivots when the first clamp member moves between the open and closed positions; and

the first actuator is connected to the arm to pivot the arm.

39. A bulge forming mechanism as defined in claim 38 wherein:

the first actuator comprises a solenoid.

40. A bulge forming mechanism as defined in claim 38 wherein:

the first clamp member further comprises a base with respect to which the arm pivots when the first clamp member moves between the open and closed positions;

the first clamp member further comprises one jaw member connected to the arm and one jaw member connected to the base, the jaw members contacting and holding the wire when the first clamp member is in the closed position.

41. A bulge forming mechanism as defined in claim 40 wherein:

each of the jaw members includes a contact surface which is semicircular shaped.

42. A bulge forming mechanism as defined in claim 41 wherein:

the arm and the base are formed from a sheet of material having a thickness;

each jaw member includes a contact surface by which to contact and hold the wire; and

the contact surface of each of the jaw members approximately the same thickness as the thickness of the sheet of material from which the arm and base are formed.

43. A bulge forming mechanism as defined in claim 40 wherein:

the first clamp member is formed from a sheet of spring tempered material;

the spring tempered material creates resilient characteristics in the first clamp member; and

the resilient characteristics normally force the jaw member on the arm away from the jaw member on the base to bias the first clamp member to the open position.

44. A bulge forming mechanism as defined in claim 43 wherein:

the first actuator comprises a solenoid having a plunger;

the plunger is connected to the arm; and

the plunger is moved by actuating the solenoid to pivot the jaw member on the arm toward the jaw member on the base and to overcome the bias of the resilient characteristics of the first clamp member.

45. A bulge forming mechanism as defined in claim 44 wherein:

the first clamp member further includes an arcuate portion which connects the arm to the base;

the resilient characteristics of the arm, the base and the arcuate portion normally bias the jaw members on the arm away from the jaw members on the base portion.

46. A bulge forming mechanism as defined in claim 45 wherein:

the arcuate portion extends in a semicircular curve to connect the arm to the base.

47. A bulge forming mechanism as defined in claim 40 wherein:

the rotating carrier rotates about an axis of rotation;

each jaw member includes a contact surface by which to contact and hold the wire; and

the contact surfaces of the jaw members are positioned concentrically about an axis of rotation of the rotating carrier when the first clamp member is moved to the closed position.

48. A bulge forming mechanism as defined in claim 47 wherein:

the contact surface of the jaw member on the base remains concentrically positioned about the axis of rotation of the rotating carrier when the first clamp member is moved to the open position.

49. A bulge forming mechanism as defined in claim 1 wherein:

at least one of the first or second clamp members further comprises jaw members which contact and hold the wire when the first and second clamp member are in the closed positions; and

the jaw members of at least one of the first or second clamp members includes a contact surface shaped to reposition the strands of the wire when contacted and held into a cross-sectional configuration having a radial component upon movement of the one clamp member to the closed position.

50. A bulge forming mechanism as defined in claim 49 wherein:

the contact surface of the jaw members of the one clamp member are crescent shaped.